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**Before the U.S. House Subcommittee on Housing and Community Opportunity**

**“Examining the Making Home Affordable Plan”**

**March 19, 2009**

Good morning Madame Chairwoman, Ranking Member Moore-Capito, and distinguished members of the Subcommittee. Thank you for holding this hearing on President Obama’s Making Home Affordable Plan and for inviting me to testify.

**INTRODUCTION**

I serve as Director of the Center for Community Capital and Professor of City and Regional Planning at the University of North Carolina at Chapel Hill ([www.ccc.unc.edu](http://www.ccc.unc.edu) and [www.planning.unc.edu](http://www.planning.unc.edu)).

For over a decade, the Center for Community Capital has conducted research and analysis into the transformative power of capital on the economic health of households and communities in the U.S. Our multidisciplinary team of academics, practitioners, economists and social scientists brings broad perspective and expertise to the work of examining how financial capital flows through communities and impacts homeownership, household financial security, and local economies. The center's in-depth analyses help policymakers, advocates and the private sector find sustainable ways to expand economic opportunity to more people, more effectively.

In my remarks, I will summarize the findings of our recent study on loan modifications, co-authored by Lei Ding and Janneke Ratcliffe. On the basis of the study findings, I will derive implications for key aspects of President Obama’s Making Home Affordable plan (“the plan”). Attached to this written testimony is the complete text of the study.

First, I will highlight our top findings and policy implications:

1. Our study finds that modifications that reduce mortgage payments significantly reduce foreclosure.
2. These findings support the plan’s primary features: Systematically modifying and refinancing mortgage loans to reduce payments will prevent many foreclosures.
3. In our view, reducing rates will provide substantial relief to many homeowners, but those who owe more than their house is worth will remain vulnerable to default. A more explicit use of principal reduction in appropriate situations should help save more homes.

## LOAN MODIFICATIONS AND REDEFAULTS

The foreclosure crisis shows no sign of abating. Over 2.3 million homeowners faced foreclosure in 2008, an 81 percent increase from 2007. Almost 900,000 properties were repossessed by lenders nationally in 2008, almost double the figure in 2007 (Aversa and Zibel 2009). The foreclosure crisis has mushroomed into a full-fledged national and global recession. Payroll employment has declined by 3.6 million since December 2007 and over one-half of this decline occurred between November 2008 and February 2009 (Bureau of Labor Statistics 2009). Job losses lead to more foreclosures, which, when added to the already oversupplied real estate market, further reduce home values, leading to even more foreclosures. The \$2.8 trillion loss in household real estate wealth from 2006 to the third quarter of 2008 has further weakened households, ultimately leading to less spending and more job loss (Board of Governors of the Federal Reserve System 2008).

Thus, what began with defaults of poorly structured mortgages has led to job losses and economic contractions that further exacerbate the delinquency, foreclosure and devaluation cycle. The Obama Administration has recognized the urgency of addressing the root cause of the problem. We concur that actions to reduce the rate of preventable foreclosures would promote economic stability for households, lenders, our communities, and the nation's economy.

One strategy to deal with mounting foreclosures is to modify mortgage loans - changing the loan terms so that borrowers can remain in their homes. To date, however, modification activity has been voluntary, non-standardized, and inconsistent. While the servicing industry reports a growing number of modifications, they are not keeping pace with the increasing number of new delinquencies. Further, there is scant evidence about the effectiveness of loan modifications, and what evidence does exist suggests a high rate of recidivism.

At the same time, studies have found that many loan modifications do not reduce mortgage payment, and in fact, many increase either the balance and/or the payment. In fact, so-called "traditional modifications" take the late fees and payments due and add them to the loan amount, thus *increasing* the burden and often resulting in higher payments (Alan White 2008). It is important to recognize that all modifications are not created equal.

Our study examines the relationship between post-modification redefault rates and different types of loan modifications. For this analysis, we use data from a large sample of recently modified loans (10,000 loans that were modified in the second quarter of 2008 to prevent default). These modified loans came from a pool of more than 1.3 million mostly subprime and adjustable-rate mortgages made during the peak of the mortgage boom (2005-2006). We examined the redefault rate of the modified loans as of December 2008, about six months after the modifications.

Not surprisingly, we find that the key to sustainable loan modifications is to reduce the payments so they are truly affordable to the borrowers. Six months after receiving a modification, homeowners whose modification led to a payment reduction has a relatively 60 percent lower rate of delinquency than those who got traditional modifications with an increased payment. However, nearly a half of the sample received no payment reduction. Supplemen-

tal analysis shows that a full third of *delinquent* borrowers received a modification that increased their mortgage payments. This is like throwing a rock to someone who is drowning.

Moreover, the findings show an even lower level of redefault when payment reduction is accompanied by principal reduction. A payment relief can be the result of a reduction in interest rate, extension of the loan term, or forbearance or forgiveness of principal. The results suggest that among the different types of modifications examined, the principal forgiveness modification has the lowest redefault rate. We believe that this is because it addresses both the short-term issue of mortgage payment affordability and the longer-term problem of underwater homeowners (those who owe more than the house value). When confronted with a crisis, underwater borrowers pose a greater default risk because they will not be able to sell their home to terminate their mortgage obligation.

Even after controlling for such factors as credit scores, delinquency status and market conditions, homeowners who obtained a rate reduction were about 13 percent less likely to redefault than similar borrowers in similar situations who did not receive such a reduction. Those whose rate reduction was accompanied by a principal reduction were even less likely to redefault, 19 percent less likely.

We also find that there are significant differences in redefault risks on the basis of the timing of the modification. Early intervention works best as it is associated with lower redefault risks. Thus, the findings suggest that waiting for borrowers to be 90 days delinquent before intervening may not be the best approach as the probability of redefault is much higher at that point in time.

As expected, we find that local economic conditions play a key role on the success of loan modifications: a one percent rise in local unemployment leads to a 1.4 percentage point increase in the probability of redefault. As the economy continues to deteriorate, it may be increasingly difficult to disentangle these macro-factors from loan-related risk factors. Even if modifications are successful in the short term, for instance, by lowering the loan rate to increase affordability, redefault may occur if borrowers later experience job loss due to a deteriorating local economy.

Finally, the results underline the importance of finding more innovative approaches to help borrowers who have negative equity in their homes. The results indicate that households with negative home equity are more likely to redefault over time, even when a modification has initially lowered mortgage payment. For these loans and loans that were poorly underwritten at origination, more significant loan restructuring or refinancing may be needed to minimize redefault risks.

## **MAKING HOME AFFORDABLE PROGRAM**

The “Making Home Affordable” program recently announced by President Obama incorporates the key findings from our study. Namely, it relies on making home mortgages more affordable by lowering payments, using a systematic and consistent framework. As such, we expect it should help prevent many foreclosures.

The mortgage refinance option will be available to more homeowners who have solid payment

history on an existing mortgage owned by Fannie Mae and Freddie Mac. Normally, many of these borrowers would be unable to refinance because their homes have lost value, pushing their current loan to value ratios above 80 percent (up to 105%). The Obama administration estimates that 4 to 5 million homeowners will be able to refinance to benefit from lower, fixed interest rates and extended terms. Although not comprehensive, as it excludes non GSE loans and higher LTV loans, this aspect of the administration program is consistent with our findings that suggest the benefits of reduced payment burdens, even before delinquency sets in.

With regard to modifications, servicers are expected to follow a series of steps in order to reduce monthly payment to no more than 31 percent of gross monthly income. We see this as a crucial element of the program as our findings indicate that reducing mortgage payments is the key to lower future redefault risks.

Lenders are required to base the decision to modify a loan on a net present value test. On the basis of this test, lenders need to estimate the cost of doing a modification compared to the cost of doing nothing. Modifications are expected to occur if the net present value of the expected cash flow is greater with a modification than without it, adjusted for an assumed rate of default under each scenario.

The modification sequence requires first reducing the interest rate (subject to a rate floor of 2%), then if necessary extending the term or amortization of the loan up to a maximum of 40 years, and then if necessary forbearing principal. Under the program, principal forgiveness or a Hope for Homeowners refinancing are mentioned as acceptable alternatives.

An important aspect of the President Obama's program is to focus on homeowners at risk, not just on homeowners that are already delinquent. This is consistent with our study findings indicating that early intervention works best as it is associated with lower default risks.

To sum up, on the basis of our study, these two components of President Obama's program should be able to minimize default risks among many homeowners now at risk. The sharp reduction in mortgage payment, to 31 percent of household income, should have the greatest impact in minimizing short term redefault risks.

## **ADDITIONAL INTERVENTIONS TO BE CONSIDERED**

Our research suggests the importance of principal reduction. Modifications that resulted in a mortgage payment reduction accompanied by a principal reduction exhibited the lowest redefault risks. When an estimated 20 percent of all homeowners with a mortgage are "underwater," it is important to find more innovative approaches to deal with negative equity. In fact, lack of equity home has long been considered a strong predictor of default. Our analysis suggests that households with little or no equity in the home are more likely to redefault but they usually would not enter serious delinquency or foreclosure unless they have negative equity.

Allowing borrowers with high loan-to-value ratios to refinance or modify into lower-rate loans can only partly solve the problem for underwater borrowers. We believe that more consideration needs to be given to incorporating principal forgiveness in loan modification, particularly if the plan bars second chances. Although principal reduction is permissible under the proposed

program, the lack of guidelines and standards for principal reduction may limit or discourage the use of this important tool in situations where it may be appropriate and necessary.

Further, success of the plan depends on the willingness and ability of servicers, lenders and investors to cooperate. Alternatively, our study findings support the use of the bankruptcy courts as an avenue for modification that can lead to appropriate principal reductions.

The plan aims to standardize the modification process, allowing troubled borrowers to get fair access to timely and consistent help. It is also important to develop guidelines to tailor modifications to the particulars of individual borrowers with specific loan products in unique housing markets. To do so, more data and more research are needed in the public domain.

We commend President Obama and the administration for proposing guidelines to streamline the modification process, allowing troubled borrowers to get timely and consistent help. However, we believe that more structured guidelines may be needed in other areas, for instance, with regard to principal forgiveness. The data to develop such guidelines exist in the shared databases and within mortgage servicers' own portfolios. We also understand that many government agencies are collecting detailed information on loan modifications. We encourage these agencies to make the data publicly available to researchers. This would allow for a broader array of insights and views in developing any additional policy steps needed.

In closing, I applaud this subcommittee for examining these important issues. Thank you.

LOAN MODIFICATIONS AND REDEFAULT RISK  
*An Examination of Short-term Impact*

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# Loan Modifications and Redefault Risk

## An Examination of Short-term Impacts

Roberto G. Quercia, Lei Ding, and Janneke Ratcliffe \*

### Abstract

One promising strategy to stem the flood of home foreclosure is to modify mortgage loans so that borrowers can remain in their homes. However, a primary concern of loan modification efforts is the seemingly high rate of recidivism. We examine the relationship between redefault rates and different types of loan modifications based on a large sample of recently modified loans. We find that the key component to making modified loans more sustainable, at least in the short run, is that mortgage payments are reduced enough to be truly affordable to the borrowers. The findings also show an even lower likelihood of redefault when the payment reduction is accompanied by a principal reduction. Unfortunately, we also find that to reduce redefault for modified loans that are currently underwater (those with negative equity) or were poorly underwritten at origination, more significant loan restructuring or refinancing may be needed.

### 1. Introduction

The foreclosure crisis shows no sign of abating. Over 2.3 million homeowners faced foreclosure in 2008, an 81 percent increase from 2007. Almost 900,000 properties were repossessed by lenders nationally in 2008, almost double the figure in 2007 (Aversa and Zibel 2009). The foreclosure crisis and the resulting credit and financial turmoil have now become a full-fledged national and global recession. Payroll employment has declined by 3.6 million since December 2007 and over one-half of this decline occurred between November 2008 and February 2009 (Bureau of Labor Statistics 2009). Job losses lead to more foreclosures, which, when added to the already oversupplied real estate market further reduce home values, leading to even more foreclosures. The \$2.8 trillion financial losses in household real estate wealth from 2006 to the third quarter of 2008 further weaken the overall economy, leading to more income loss (Board of Governors of the Federal Reserve System 2008).

With the large number of foreclosures and the increasing numbers of delinquencies, actions to reduce the rate of preventable foreclosures would promote economic stability

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for homeowners, their communities, mortgage lenders, and the nation as a whole. To date, government initiatives appear to have been unable to fix the problem as foreclosures continue to mount. The expectation is that the new Obama administration and the new Congress will focus on policy proposals to assist homeowners directly. Tools being considered include more aggressive loss mitigation programs (Inside Mortgage Finance 2009). Lawmakers want to expand access to FHA refinancing, the HOPE for Homeowners program (H4H), and other initiatives, such as the loss-sharing modification program of the Federal Deposit Insurance Corporation (FDIC).

Borrower inability to meet mortgage payments is the core of the foreclosure problem, and loan modifications are seen as a means to reduce the payment burden. By providing troubled homeowners with relief, modifications can be regarded as a tool for foreclosure avoidance. For instance, under the FDIC's streamlined loan modification program, mortgages that meet certain criteria can be modified to decrease the borrower's payment by 10 percent or more and help borrowers achieve sustainable payments by lowering their housing payments to 38 percent of their gross income (FDIC, 2008). As recently announced by President Obama, the Homeowners Affordability and Stability Plan creates a \$75 billion program to subsidize loan modifications that would reduce the monthly mortgage payment of a troubled homeowner to as low as 31 percent of monthly household income (Stolberg and Andrews 2009).<sup>1</sup> In practice, OCC and OTS (2008) documented that about 133,000 loans were modified in the third quarter of 2008, a 16 percent increase from the second quarter of 2008, but the number of modifications continued to fall further behind the number of new delinquencies.<sup>2</sup>

A primary concern with loan modification efforts is the seemingly high rate of recidivism. Within six months, over half of all modified loans were 30 days or more delinquent and over a third were 60 days or more delinquent (OCC and OTS 2008). Do these high rates of re-default imply that loan modifications are failing?

Unfortunately, the complexity of the many factors involved in loan modifications makes this question less straightforward than it appears. Modifications do not necessarily reduce mortgage payments, only some do. Loan modifications can lower monthly payments by extending the loan term, or by reducing the interest rate or the mortgage's outstanding balance, or by a combination of practices. However, traditional modifications only add the delinquent payment to the unpaid principal, thus increasing the amount of debt and often resulting in higher monthly payments (White 2008). This type of modification is

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<sup>1</sup> Under this plan, a mortgage lender needs to reduce a borrower's payments to 38 percent of monthly income and the federal government would provide additional incentives, such as a \$1,000 upfront payment per modification and more payments if the borrower keeps current (Stolberg and Andrews 2009). The government would also match additional reductions to bring the payment to as low as 31 percent of monthly income. The payment can be reduced via a waterfall of options, typically beginning with interest rate reduction.

<sup>2</sup> During the same period, the number of 60+day delinquencies increased by 17 percent and the ratio of the number of loan modifications to the total number of 60+day delinquencies was only 7.2 percent of in the third quarter 2008.

likely to lead to higher redefault risks in the long run, especially when higher debt burdens are accompanied by declining house prices.

There is also an important temporal aspect to loan modifications during an extended period of economic downturn. A loan modification may be successful in addressing the initial problem, for instance, by reducing the monthly payment to address a lack of affordability after an interest rate reset. However, as a result of the deepening financial and economic crisis, borrowers can easily face new problems shortly after a loan modification, such as loss of a job, that can lead to another mortgage delinquency and redefault. Thus, it is important to examine the short- and long-term implications of loan modifications.

Using data from a large sample of recently modified nonprime loans, we examine why some loan modifications are more likely to redefault than others. More narrowly, we examine the types of modifications that are more likely to redefault in the short run. In a companion study, we will examine loan modifications and the dynamics of principal reduction over a longer period of time.

The paper proceeds as follows. Section 2 reviews the current practices of loan modifications and the literature. Section 3 discusses the data and outlines the logistic models of the redefault behavior of borrowers with modified loans. Section 4 presents and discusses the results, and the final section concludes.

## **2. Literature Review**

### ***Implementing loan modifications***

In early 2007, the majority of modifications involved a capitalization of arrears for seriously delinquent loans and/or a principal forbearance, according to Inside B&C Lending (2008). In late 2007 and early 2008, the pre-reset modifications (interest rate freeze or reduction) on subprime adjustable rate mortgages (ARMs) increased significantly. More recently, modification activity has focused on interest rate reductions and less seriously delinquent borrowers. But the category of principal write-down is still largely theoretical and has not been used to any significant degree (White 2008). As a result, some loan modifications have lowered the mortgage payments but they generally are not reducing the total mortgage debt.

The federal government has relied primarily on encouraging lenders to voluntarily modify the terms of existing mortgages. In October 2007, the HOPE NOW program, a coalition of mortgage servicers and housing counseling agencies formed to stimulate a voluntary effort to restructure mortgages. In June 2008, the HOPE NOW alliance members issued guidelines for a streamlined foreclosure prevention process for committed servicers. In June 2007, American Securitization Forum (ASF) also issued guidelines for the modification of securitized subprime residential mortgage loans (ASF, 2007). In August 2008, the FDIC, which took over the former IndyMac Bank, launched

the first streamlined loan modification program for struggling mortgage borrowers meeting certain criteria. This program is designed to help troubled borrowers achieve a sustainable 38 percent HTI ratio in the mortgage and decrease the borrower's payment by 10 percent or more.<sup>3</sup> To reach affordable levels, mortgage modifications combine interest rate reduction, extended amortization, and partial principal forbearance. In December 2008, government-sponsored enterprises (GSEs) started a streamlined modification program applying many of the features of the FDIC loan modification program.<sup>4</sup> As mentioned early, the recently announced Homeowners Affordability and Stability Plan encourages lenders to bring the mortgage payments to as low as 31 percent of monthly income by providing incentives to lenders, servicers and borrowers.

The current loan modification programs aim to standardize the modification process, allowing troubled borrowers to get timely and consistent help. Servicers can examine readily available loan criteria, such as loan-to-value ratios, loan amount, credit scores and payment history, and debt ratios, to make a quick determination of qualifications. While the number of completed loan modifications steadily increased in 2008, a number of barriers and concerns have impeded the wider adoption of loan modifications, and the number of modifications continues to fall further behind the number of new delinquencies (OCC and OTS 2008).

### ***Barriers of loan modification***

Eggert (2007) summarized several barriers to loan modifications and indicated that servicers' costs and self-interests are the primary hurdles. Loan modifications have been labor intensive and usually very expensive for servicers, with costs estimated at between \$500 and \$600 per modification (Eggert 2007). Because of the high cost of the loan modification, servicers may want to save money by doing nothing, in the hope that the loan can cure by itself without any action (Mayer and Gan 2006). Furthermore, since subprime servicers derive substantial income from late fees, and can expect to be reimbursed for the costs of foreclosure, they may have little interest in helping borrowers cure the delinquency. As a result, many servicers have more incentive to allow a loan to proceed to foreclosure than to resolve the delinquency. Finally, since some servicers, especially subprime servicers, have been accused of abusive practices designed to increase their income to the detriment of borrowers, their internal policies may discourage loan modifications (Eggert 2004). Of course, servicers are not interested in keeping borrowers in long term delinquency so much because in many cases it involves a lot of work which they do not get paid much for in the current market. For example,

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<sup>3</sup> If the initial modification at a 38 percent of HTI does not decrease the borrower's payment by 10 percent or more, the HTI ratio can be lowered to 35 percent and then to 31 percent to achieve the 10 percent savings. In cases where a 10 percent reduction can not be achieved, the 31 percent HTI ratio is used for affordability. FDIC (2008) provides the technical details about the loan modification program.

<sup>4</sup> The underwriting criteria include missing at least three mortgage payments, proof of financial hardship, not in active bankruptcy, and payment on first-lien mortgage not exceeding 38 percent of a borrower's gross monthly household income (Inside Mortgage Finance, 2008). Servicers are expected to begin actively soliciting eligible borrowers with owner-occupied mortgages and loan-to-value ratios of 90 percent or more. Servicers will be compensated \$800 for each successful loan modification under the program.

servicers have to advance monthly payments on loans that are not paying and that will be a negative to them.

For securitized loans, the Pooling and Servicing Agreement (PSA), a legal document that outlines the responsibilities of the servicer, restricts the extent of loan modifications allowed. Bound by the PSAs, it is not easy for servicers to work with investors of securitized mortgages to achieve loan modifications, and usually it is not clear what is legally permissible (Eggert 2007). The differences in the type and scope of modifications that are explicitly permitted among different trustees raise operational compliance costs and litigation risks. So securitization seems to affect servicers' incentives and slow or reduce their propensity to modify loans – even when such action would be in the collective interests of investors and borrowers.<sup>5</sup> One recent study suggests that frictions due to the securitization preclude efficient loan modifications and increase the foreclosure rate: Conditional on a loan becoming seriously delinquent (60+day), the likelihood of a portfolio loan default is lower in absolute terms than that of a securitized loan default (19 percent to 33 percent, respectively, relative to the mean foreclosure rate) (Piskorski, Seru, and Vig 2008).

By introducing foreclosure alternatives like a loan modification that likely have a lower cost for the borrower, the lender/servicer encounters an implicit moral hazard issue: the willingness to negotiate a less costly solution can itself lead to more defaults (Ambrose and Capone 1996). In other words, providing a less costly option by modifying the terms of a mortgage may signal to other borrowers that the costs associated with default have declined sufficiently, which would result in more defaults than otherwise would have occurred. To limit the moral hazard problems associated with lowering borrower default costs, Ambrose and Capone (1996) suggested that lenders or servicers should restrict foreclosure alternatives to liquidity-constrained borrowers. In practice, the moral-hazard problem has been addressed by the requirement of full financial disclosure by defaulted borrowers; only true hardship cases will receive assistance (Inside Mortgage Finance 2008).

Significant redefault risk may remain if modifications are not significant enough. Many of the current modifications may not effectively help troubled borrowers, most likely because the modifications did not bring mortgage debt in line with declining home values or reduce the mortgage payment to an affordable and sustainable level. Other factors—such as the high debt burden, increased unemployment rate, the continuing decline in property value—also may contribute to high redefault rates. In one review, 38 percent to 40 percent of borrowers with modified mortgages redefaulted (Credit Suisse 2007), indicating that servicers often have not modified the loans enough to allow some borrowers to make their payments. About 53 percent of mortgages modified in the first quarter of 2008 redefaulted in six months (OCC and OTS 2008). As the subprime market worsens and housing prices continue to decline, more innovative solutions that can effectively help troubled borrowers will need to be considered.

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<sup>5</sup> The ASF (2007) indicated that modifications were allowable to the extent they improved the NPV for the “aggregate investor.” Despite this statement, however, investors and servicers are still sending mixed signal.

### *The impact of loss mitigation efforts*

Why would some borrowers with modified mortgages redefault? Broadly, there are two complementary theories to explain why borrowers stop making their mortgage payments: the “option” theory and the “trigger-event” theory. According to the option theory, the borrower exercises the put option when he has a negative equity in the property (Foster and Van Order 1984; Vandell and Thibodeau 1985; Kau, Keenan, and Kim 1993). When the property value has fallen below the amount owed on the loan, the borrower has the incentive to default and to let the lender take the property. The trigger-event theory focuses on “life-changing” events that affect the homeowner’s ability to make mortgage payments, because of either a sudden drop in or loss of income or an unforeseen increase in expenses (Vandell 1995). Income disruptions typically are associated with a loss of employment or adverse change in family circumstances, such as an illness, death or divorce. In addition, some environmental factors, such as local economic conditions and changes in underwriting standards, also influence a borrower’s decision to default (Cutts and Merrill 2008). Since most borrowers with modified loans were delinquent to some degree before the loan modifications, most if not all of them should have had disruptions in income or unforeseen expenses. As a result, payment relief through a loan modification should help them keep current with required mortgage payments. Of course, the level of equity in the property is also important, because if there is sufficient equity in the home, borrowers can simply sell the property or refinance it if they cannot make the mortgage payment. In these cases, income disruptions are usually insufficient to cause severe default. More simply put, loan to value has always been the most important determinant of default. The conventional wisdom is that the trigger events explain delinquency while the option theory explains default; in this way, they are not really competing, but complementary, explanations.

One group of studies has examined whether loss mitigation efforts including loan modifications prove helpful to borrowers. For FHA loans, Capone and Metz (2003) found that loss mitigation programs successfully lowered the foreclosure rate; the probability of a loan reaching foreclosure is dramatically reduced when the loans goes through a forbearance agreement (from 77.6 percent in 1998 to 14.5 percent in 2002). Cutts and Green (2005) provided an excellent review of servicing literature and Freddie Mac’s innovations in loan servicing and loss mitigation. Using Cox’s hazard model to investigate the impact of repayment plans on foreclosure incidence they found that borrowers who enter a repayment plan have a much lower probability of losing their home (80 percent lower for borrowers overall and 68 percent lower for low- to middle-income borrowers). They also found that borrowers who had previously had a loan modification but were again in default were significantly less likely to fail than those who had not previously been through a loan modification, perhaps because of the borrower’s willingness to work with the servicers to reach a positive resolution. Pennington-Cross and Ho (2006) found that differences in servicing practices affect the probability of default to a strong degree and the prepayment risk to a lesser, but still significant, degree. Cutts and Merrill (2008) also documented that the success rate of modified loans varies by the amount of arrearage capitalized into the loan modification; not surprisingly, there is a direct relationship between a lower arrearage and a lower failure rate.

However, there is scant evidence about the effectiveness of different types of loan modifications. Credit Suisse (2008) documented that rate-freeze modifications and principal reduction modifications have lower redefault rates than traditional modifications, but the analysis does not control for borrowers' risk characteristics. For example, the data found that reset modifications (primarily rate freeze) only exhibited a 15 percent delinquency rate 8 months post-modification, thus out-performing the other categories. But about 10 percent of the loans that received a reset modification were delinquent prior modification, compared to the much higher delinquency rates (usually 80-85 percent) for loans modified by other means. This illustrates the need for more precise analysis of performance of modifications, taking into account borrower, loan and market factors.

Data on recent modifications are available from a number of sources, including the OCC and OTS Mortgage Metrics Report, the Foreclosure Prevention Report from Federal Housing Finance Agency (FHFA), the HOPE NOW coalition of mortgage servicers and counselors, the Mortgage Bankers Association, and the Mortgage Servicing Report by the State Foreclosure Prevention Working Group. These studies and reports provide important evidence as to the effectiveness of the voluntary restructuring approach. However, few of them specify the kinds of modifications implemented or attempt to understand the impact of the modifications beyond blunt statistics. In this analysis, we examine the short-term impact of different loan modifications by identifying which kinds of modifications are more sustainable than others, and under which circumstances. The data and methods used to examine these issues are described below.

### **3. Data and Methodology**

#### ***Data***

Loan-level data on individual mortgages are available for a national sample of private-label securitizations, known as Columbia collateral file (White 2009). The data is available through remittance reports produced by the trustee on several mortgage pools, altogether representing more than four million outstanding mortgages. During the 2007–2008 reporting period, the pools were serviced by many of the leading mortgage servicing companies.<sup>6</sup> The monthly performance reports provide loan-level details on loan characteristics, defaults, foreclosures, bankruptcy, and losses on foreclosed homes. The reports also have information about the loan balance, mortgage payment, and interest rate, both before and after modification, which allows us to identify whether total mortgage debt, interest rate, or mortgage payments are reduced for individual homeowners.

This analysis focuses on a sample of mortgage loans derived from remittance reports for 2006 securitizations, which covers about 1.3 million loans mostly originated in 2005 and 2006. We chose to examine the 2006 deals because it is generally accepted that recent

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<sup>6</sup> As documented by White (2008), a subset of this dataset includes seven of the top ten subprime originators in 2006 and six of the top fifteen subprime servicers in 2007.

nonprime vintages, especially subprime ARMs, have performed worse than earlier ones, as a result of relaxed underwriting criteria, higher combined loan-to-value ratios, and the popularity of risky loan terms (Immergluck 2008). Although our sample is national in scope, about half of the mortgages are concentrated in California, Florida, and a few other high-growth states. As of April 2008, the top five servicers of the 2006 deals—Wells Fargo Bank, Countrywide Home Loans Servicing LP, Aurora Loan Servicing Inc., Ocwen Loan Servicing LLC, and Bank of America—accounted for about 47 percent of all the loans.

Generally, the data do not allow us to explicitly identify the loan types for all the loans (59 percent have missing values for the loan type variable). As Table 1 shows, the credit quality of the loan types as measured by the average FICO scores differ from 629 for subprime loans, to 698 for conventional loans, to 702 for Alt-A loans. However, after excluding a very small share of FHA/VA and commercial loans (0.85 percent), we are confident that a vast majority of the loans in this sample are nonprime loans because most of them have at least one risk characteristic that is more common in the subprime sector.<sup>7</sup> Of course, restricting the analysis to modified loans alleviates this concern to some degree. As Table 1 shows, the average FICO score, average loan-to-value ratio, and average interest rate of modified loans do not differ much across loan types. If lenders can classify borrowers into different loan types based on an assessment during the origination process of the likelihood of default, differences in the redefault of modified loans cannot be attributed to selection on unobservables at the time of origination.

Of course, this sample of loans does not represent a statistically random sample of all mortgage loans or all nonprime mortgage loans. The loans are securitized loans, and servicers of securitized loans may have different incentives than lenders who retain ownership of mortgage loans. So this sample of voluntary loan modifications may not be representative of loan modifications by portfolio lenders. Nevertheless, given that nonprime mortgages account for more than half of all foreclosures,<sup>8</sup> and that the vast majority of nonprime loans that led to the crisis were securitized, this sample provides important insights as to what voluntary loan modification programs have yielded to date in the nonprime market.

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<sup>7</sup> It is safe to assume at least a vast majority of these private-label securitizations as nonprime loans. About 36 percent of those for which data on the loan type variable are available were labeled as subprime or Alt-A loans. About 40 percent were classified as conventional and the rest, 24 percent, were labeled as conforming or non conforming loans. However, many of those loans listed as conventional or with missing value are not typical prime loans. As suggested in the literature, it is reasonable to assume the following characteristics significantly increase mortgage credit risk: 1) borrower FICO score less than 620; 2) interest-only loan; 3) negative amortization; 4) limited or no documentation; 5) original loan-to-value ratios higher than 90 percent (Foote, Gerardi, Goette, and Willen 2008; Immergluck 2008). A vast majority of conventional loans and those with missing values (86 percent and 90 percent, respectively) have at least one of these risky loan features. In this sense, most of them should be considered subprime or Alt-A mortgages, although they were coded as conventional, conforming, or with missing values.

<sup>8</sup> Without including Alt-A loans, subprime loans alone accounted for 48 percent of all foreclosure starts in the second quarter of 2008 (Mortgage Bankers Association 2008).

### *Characteristics of modified loans*

As Figure 1 shows, the number of loan modifications among this sample increased sharply in 2008, from about 4,800 in March 2008, to about 6,200 in May 2008, and then to almost 9,000 in November 2008. This pattern is consistent with the national trend, which saw loan modifications increase in 2008 (Evers 2009). We restricted the analysis to modifications in one quarter only to alleviate concerns that policy environment and macroeconomic conditions might have changed substantially during the study period. During the second quarter of 2008, there were 17,592 loan modifications in the sample—a large number considering that in the same quarter OCC and OTS (2008) reported 114,439 modifications based on a sample representing over 60 percent of all outstanding mortgages and FHFA (2008) reported 15,372 modifications by the GSEs.

After excluding second-liens, originations before 2005, loans with missing data, non-owner occupied loans, and those whose final outcomes could not be identified, we have a total of 9,693 loan modifications reported. The number of monthly modifications increased from 2,280 to 4,011 between April and June 2008. The data also provide rich details on individual mortgage delinquency and foreclosure, allowing us to track the performance of the modified loans through December 2008. Although the majority of the modified loans had experienced some delinquency, 37 percent had never experienced any delinquency during the 12 months before the modification. So the borrowers holding modified loans can be divided into two basic groups: those with loans that were already past due under the current terms; and those that remained current but were considered to be in “imminent default”, for example as a result of pending interest rate resets.

Descriptive statistics of the modified loans are listed in Table 2. Borrowers holding modified loans generally had quite low origination FICO scores, with an average of about 614. More than a half the loans were refinance loans (54 percent). Most of these loans were adjustable rate mortgages with a 30-year amortization period. About 24 percent of them were interest-only mortgages and a small percentage (4 percent) negative amortization loans. Over one-third of them had limited or no documentation at origination. About two-thirds originated in 2006; the remainder in 2005.

Just over a half of the modifications (54 percent) led to reduced monthly principal and interest (P&I) payments (with at least one percent reduction in mortgage payment; see Table 3). But 23 percent of reported modifications resulted in payment increases, likely a product of recasting arrears. The remaining 23 percent of modifications had roughly the same P&I payment (less than one percent change). On average, the monthly payment was reduced by \$173 for all modified loans. But the reports do not disclose whether the payment changes and rate reduction are permanent or temporary for this sample.<sup>9</sup>

These loan modifications actually increased the aggregate outstanding mortgage debt. The amount owed on the modified loans went from \$2.31 billion before modification to \$2.33 billion after modification. A small share of modified loans (8.4 percent) did have

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<sup>9</sup> The reports started to identify whether a loan modification is temporary or not from November 2008 but the variable is not well populated.

their principal balance reduced, but only 299 (3 percent) reduced principal by more than 20 percent.<sup>10</sup> The news is slightly better regarding the reduction in interest rates. More than half (about 59 percent) experienced an interest rate reduction. Because of the rate reduction, the average interest rate of modified loans dropped from 8.84 percent to 7.16 percent after modification, significantly higher than the prevailing 30-year fixed rate on prime mortgages during the period of a little higher than 6 percent.

As Table 4 summarizes, the most common modifications were either interest reduction only (53 percent), in which the interest rate was cut but the principal remained the same or increased slightly, or a traditional modification (39 percent), in which the interest stayed the same but principal balance and mortgage payment increased slightly. These increases were likely because of capitalization of unpaid interest or other charges. For loans modified in the second quarter of 2008, about 44.7 percent were foreclosed or 30+days delinquent as of December 2008, slightly lower than the 55 percent six-month redefault rate reported by OCC and OTS (2008). Over 25 percent were 90+days delinquent or in the foreclosure process.

However, redefault rates varied by type of loan modification. As Figure 2 shows, modifications with a reduced mortgage payment have a lower redefault rate than those with the same or a larger mortgage payment (38 percent, 46 percent, and 60 percent respectively). A similar pattern can also be found for the interest rate reduction modifications (Figure 3).

### ***Modeling***

Why are some loan modifications more sustainable than others, which redefault quickly? In our empirical analysis, we want to identify the kinds of loan modifications that are more successful than others. The simplest approach to do this is to use the following specifications:

$$\Pr(Y_i = 1 | \text{Modify}) = f(\alpha + \beta * \text{Modify}_i + \gamma * X_i + \eta * S_i + \kappa * \delta_i + \varepsilon_i) \quad (1)$$

The dependent variable is an indicator variable for a modified loan  $i$  that takes a value of 1 if the loan redefaults. A loan is considered in default if it was foreclosed or it was in delinquent status (including foreclosure post-sale or REO status) as of December 2008.  $X_i$  is a vector of factors that may influence the outcome of a modified loan.

Specifically, we controlled the following loan and borrower characteristics: FICO score at origination, documentation type, adjustable interest rate, interest-only, loan amount (in log), loan purpose, and the estimated current loan-to-value (LTV) ratio<sup>11</sup> when modified.

<sup>10</sup> White (2008) suggests some of these large principal reductions may have resulted from litigation.

<sup>11</sup> Of course, consumers usually do not observe home equity in static terms and recent movement (trends and volatility) matters as much as absolute changes. However, the trend (house price appreciation rate) and volatility variables are highly correlated with the estimated LTV variable. In fact, the estimated current LTV ratio is determined by the original LTV ratio and recent house price changes. We decided not to

We estimate the current LTV ratio by dividing the unpaid balance when the loan was modified by the estimated house price in the second quarter of 2008, using the original house price and the house price index (HPI) at the metropolitan statistical area (MSA) level provided by the Office of Federal Housing Enterprise Oversight (OFHEO). If the property is located outside an MSA, we used the state HPI. We used the county unemployment rate as of October 2008 to represent local economic conditions.

This approach makes the following identification assumption: conditional on observables, there is a random assignment of troubled loans to different types of modifications. It is nevertheless possible that after conditioning on a host of observables, the assumption of a random assignment into different modifications at the time of modification may be violated, making the estimate biased. If servicers decide the types of modification based on unobservable private information about the borrower quality at the time of modification, the differences in redefault rates among modified loans might simply reflect different conditions of these loans. Consequently, our results could be driven by selection on unobservables at the time of modification and the estimated value of  $\beta$  may be biased because of the selection bias.

We alleviated this concern by controlling for the delinquency status and prior delinquency history of the borrower *at the time* of modification. We expect the delinquency severity represented by the delinquency status at the time of modification and the number of months in delinquency during the preceding 12 months to capture some of the information regarding quality of the borrower that is revealed *between* origination and modification. On the one hand, being late for many months would incur a significant increase in principal debt (recasting arrearages). On the other hand, prior delinquency behavior should be a good predictor of future performance of the same borrower. These variables are hypothesized to be important factors when servicers decide the type of modifications and to be the predictors for redefault.

As suggested in the literature, servicers have a significant impact on the performance of delinquent loans (Pennington-Cross and Ho 2006; Stegman, Quercia, Ratcliffe, Ding, and Davis 2007). We expect that the unobservable soft information of the practices of servicers has a significant impact on the performance of modified loans. We further controlled the dummies ( $S_i$ ) of major servicers to capture unobservable information of different servicers. We also included dummies for two major states ( $\delta_i$ , California and Florida) to account for variation of socioeconomic conditions across regions and controlled a time dummy for all originations in 2006. These controls should reduce the bias in the estimation.

*Modify* is a set of indicators of different types of loan modifications. In this specification,  $\beta$  measures the impact of different types of loan modifications on the performance of modified loans. Specifically, we tried two sets of loan modification variables. The first set of variables focuses on the level of payment relief induced by the loan modification.

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include the house price movement variables in this analysis, but we are interested in considering this factor in a dynamic model in a companion study.

We are interested in testing how the mortgage payment reduction affects the redefault probability of modified mortgages. By using a set of variables capturing the level of payment relief after the modification, we can determine the sensitivity of the redefault risk to the change in mortgage payment. The second set of variables focuses on the different changes in loan terms. By considering two features of loan modifications—interest rate change and principal change—we constructed four mutually exclusive dummy variables for the combinations of these two characteristics. These are  $r0p0$  for “rate reduction and principal write-down,”  $r1p0$  for “principal write-down only,” and  $r0p1$  for “rate reduction only.” The category  $r1p1$ , “no rate reduction and no principal write-down,” which can be roughly regarded as the traditional loan modification, is set as the reference group.

To illustrate the effect of loan modifications on a borrower’s monthly mortgage payment obligation, following Cutts and Merrill (2008) we assume a borrower who is  $N$  months into his 30-year fixed-rate loan with monthly interest rate  $r$  and who has missed interest payments of amount  $i$  along with associated monthly escrows for taxes,  $T$ , and insurance,  $I$ , if applicable. His principal balance is given by  $P_{N-M}$  (his last payment was made in month  $N-M$ ) and his arrearages equal  $M^*(i+T+I)$  or  $\sum_{t=N-M+1}^N (i_t + T + I)$ . For simplicity, any other additional fees are not considered here. A traditional loan modification places the delinquent arrearage into the unpaid principal balance and re-amortizes the loan over the remaining term, making his new payment:

$$x_{new} = \frac{r \left[ P_{N-M} + \sum_{t=N-M+1}^N (i_t + T + I) \right] (1+r)^{(360-N)}}{(1+r)^{(360-N)} - 1} \quad (2)$$

If the amortization has been extended to a new term,  $TERM$ , then the new monthly mortgage payment can be determined by:

$$x_{new} = \frac{r \left[ P_{N-M} + \sum_{t=N-M+1}^N (i_t + T + I) \right] (1+r)^{TERM}}{(1+r)^{TERM} - 1} \quad (3)$$

So, the new total debt is determined by the original unpaid balance and the capitalized arrearages. The new monthly mortgage payment is a function of the new total debt, new interest rate, and the new amortization term. Assume we have a fixed-rate mortgage originated in January 2006 with an original principal of \$238,726, the average of our study sample. The interest rate was 8.84 percent annually (0.737 percent monthly), the average of all modified loans in this sample. So, the monthly mortgage payment would be \$1,893. As of May 2008, the borrower was 90-days delinquent on this mortgage, which means his last payment was in February 2008 and the outstanding balance on his mortgage was \$234,878. The three missed interest payments total \$5,187. And if we assume that property taxes and insurance together are 3 percent of the original principal annually, then we add another \$1,762 to bring the escrow account current, making the total amount due \$241,827.

Under the traditional loan modification structure, the arrearages will be added to the principal and re-amortized over the remaining 331 months; his new mortgage payment will be \$1,953, a four-percent increase. To lower the borrower's payment, for example, by 10 percent, servicers can either lower the interest rate to 7.33 percent from 8.84 percent or reduce the principal to \$210,949, or use a combination of the two. For example, reducing principal to \$223,134 and the rate to 8.20 percent lowers the mortgage payment by 10 percent. A rate reduction to 8.12 percent and a term extension to 40 years can also reduce the payment by 10 percent.

#### **4. Empirical Results**

We now describe the results from the logit regression models. The dependent variable is whether or not the loan was 30+days delinquent (including those that had been foreclosed) as of December 2008, as in Table 5, or at 90+days delinquent, as in Table 6, conditional on the loan being modified during the second quarter of 2008. In Model 1 we used the measures of the change in mortgage payment, while in Model 2 we tried different types of loan modifications. In Table 7, we further tested the relationship between redefault risk and the level of equity in the property for those modified loans with significant payment relief. We report the estimated coefficients, p-values, and marginal effects of different models in the tables.

##### ***Redefault risk and payment relief***

Relative to a modification with increased mortgage payment, a loan modification that lowers the mortgage payment by at least 5 percent can significantly lower the redefault risk. Based on Model 1 in Table 5, it is estimated that the six month redefault rate for an average borrower will be about 55.6 percent if the mortgage payment is increased. As Table 5 shows, a modification reducing the borrower's payment by just 5 to 10 percent lowers the probability of redefault (30+day) by 10.3 percent, compared to a modification with an increased mortgage payment. If the payment is lowered by 30 percent to 40 percent, the probability of redefault is more than 18 percent lower. When redefault is measured by 90+day delinquency, the results are consistent but the magnitude of the impact is less. Overall, the results indicate that modifications that reduce the borrower's monthly payment do reduce the redefault rate. This suggests that the key component of a successful loan modification is whether the modification is able to reduce the mortgage payments enough to be truly affordable to the borrowers.

To illustrate the effect of payment relief on redefault rate, we estimated the six-month, 90-day delinquency probability for an average nonprime borrower who was 90+day delinquent as of May 2008. As Figure 4 shows, when the mortgage payment is reduced by 7.5 percent by lowering the interest rate, the probability of 90+day delinquency drops from over 39 percent to 32 percent. And if the payment is cut by 25 percent, the 90+day redefault rate drops further to about 28 percent.

Because a loan modification with a principal write-down can also reduce the loan-to-value ratio, such a modification has an even lower redefault rate, even when it results in

the same level of mortgage payment. Among all approaches that can lower the payment by 7.5 percent, the redefault rate for a modification based on a principal write-down is 0.9 percent lower than for one based on an interest rate cut. When the payment is reduced by 25 percent, the redefault rate of a principal write-down modification is 2.2 percent lower than that of a rate-reduction modification. The difference in the redefault rate seems modest, likely because we used a continuous loan-to-value variable; in reality, however, the impact of loan-to-value on default may be non-linear. This issue will be revisited a little later.

### ***Redefault risk and different types of modifications***

Conditional on being modified, a loan with a reduced interest rate, a reduced principal, or both is less likely to redefault, relative to a loan modification where neither the principal nor the interest rate is reduced. In the latter, a loan is modified either by extending the loan term or by adding the unpaid interest and escrow payment to the total loan balance, which usually results in an increased mortgage payment. As Table 5 shows, the coefficients of three loan modification dummies ( $r0p0$ ,  $r0p1$ , and  $r1p0$ ) are consistently negative and significant. The effects are large: after controlling for other variables, a combination of principal write-down and rate reduction lowers the probability of redefault by 19 percent. When the modification involves a rate-reduction only, the probability of redefault is lowered by 13 percent. The principal write-down itself has a similar effect but the magnitude is a little smaller (10 percent). The results are generally robust enough when we use the 90+day delinquency as the outcome variable except the principal write-down group ( $r1p0$ ) becomes insignificant.

Though it seems the combination of principal write-down and rate reduction is more effective in reducing the redefault rate, we cannot conclude on the relative effectiveness of different loan modifications here because these variables do not account for the magnitude of the rate reduction or principal write-down. For example, if the level of principal reduction has been marginal, as in this case, it is reasonable to expect that the impact of the principal write-down modification would be quite small. However, the evidence supports the view that the type of loan modification has substantial impact on the performance of modified loans and that modifications need be tailored to the particular borrower based on household and product characteristics.

### ***Redefault risk and home equity***

In the short run, the principal write-down may influence the performance of modified loans by lowering both the mortgage payment and the total debt. Since the results suggest that redefault risk will be significantly lower if the mortgage payment is reduced by at least 5 percent, we examine the impact of home equity on redefault risk for those loans with significant payment relief. Instead of using a continuous variable, we ran a separate regression in which the loan-to-value ratio was coded into buckets for all modified loans with a 5 percent or more reduction in their mortgage payments. When we used 30+day delinquency as the measure of default, the results suggest the equity in the home does matter. Relatively to borrowers with substantial equity in the property (with estimated

loan-to-value ratios less than 70 percent), borrowers with less equity or negative equity in the property are more likely to default (all the coefficients are significant at 0.05 level). However, when we used serious delinquency (90+day) as the measure of default, only borrowers with negative equity remain significantly more likely to default (significant at 0.1 level), even with the reduced payment. This suggests households with less or negative equity in the property are more likely to redefault even when the modifications lower their mortgage payments. But they usually would not exercise the put option (foreclosure or serious delinquency) unless they have negative equity. It is reasonable to expect that during the period of house price depreciation, underwater borrowers (those with negative equity) are more likely to default (ruthless default) even if their payments are affordable to them, and the results support this hypothesis.

In the long run, those modified but still underwater loans may have very high probability of redefault. According to the option-based theory of default, as long as the equity in the home is negative, the option to default remains in the money (see, for example, Foster and Van Order 1984) and borrowers will be more likely to default when confronting a crisis. More simply put, loan to value has always been the most powerful predictor of default, and borrowers whose home is worth less than what they owe are more likely to default, either in a “ruthless” manner, or because they cannot afford to sell the house if they need to. This will be especially the case during a prolonged period of economic downturn, which heightens the likelihood of job loss and continued house price declines. We plan to examine the role of house price changes and the level of home equity using a dynamic model in a companion paper.

### ***Results of other controls***

The sign and significance of the coefficients of other variables are generally as expected. Loans originated with less than full documentation, adjustable rate mortgages, and home purchase mortgages are more likely to redefault. Nonprime purchase mortgages originated during the peak of the subprime bubble seems to have a very high risk. The results also suggest that some loans or loans in certain markets were poorly underwritten at origination, so many mortgage holders simply could not afford them, even with reduced monthly payments.

Not surprisingly, early intervention seems to result in lower redefault risks. Relative to borrowers who are current on their mortgage payment, those whose loans were modified after only one to two missed payments are 12 percent more likely to default, compared to 14 percent for those whose modifications occurred after three or more missed payments (Model 1 in Table 5). The results suggest that loans should be modified as early as possible after a missed payment; ideally, serious consideration should be given to modifying loans preemptively.

Local economic conditions are a crucial factor affecting the ability of borrowers to meet their debt obligations, even after a loan modification. The local unemployment rate is a significant predictor of redefault in all models, with redefault rates higher in places with a

high unemployment rate: one percent increase in the area unemployment rate increases the probability of redefault by about 1.4 percent.

Two other significant results are worth mentioning. First, the coefficient on the origination FICO score suggests that, conditional on being modified, loans with higher FICO scores redefault less, which is consistent with the negative relationship one typically observes between FICO and delinquencies. Second, consistent with findings elsewhere, market and servicing seem to matter. Because of unobserved characteristic, loans in Florida, those serviced by Servicer 2, and those originated in 2006 are more likely to redefault after being modified, even after controlling for important determinants.

## **5. Conclusions**

Confronted with the worst financial and economic crisis in decades, government and industry are considering strategies to deal with the flood of home foreclosures. One promising strategy is to modify mortgage loans so that borrowers can remain in their homes. Unfortunately, there is scant evidence about the effectiveness of loan modifications, and the evidence that does exist suggests a high rate of recidivism. In this article, we examine the relationship between post-modification redefault rates and different types of loan modifications. For this analysis, we use data from a large sample of recently modified loans.

Our study attempts to identify those modifications that work and those that are more likely to lead to redefault. We find that the key component to making modified loans more sustainable, at least in the short run, is that the mortgage payments are reduced enough to be truly affordable to the borrowers.

Unfortunately, this is contrary to many practices today. According to White (2008), most loan modifications do not lead to lower payments, in fact, many result in higher payments and higher balances. This is because traditional modifications add the payments owed plus any penalties and fees to the outstanding balance without changing other terms of the loan. By contrast, to successfully enable a struggling homeowner to meet their obligation, loan modifications need to significantly reduce mortgage payment. For example, a modification that reduces the mortgage payment by 35 percent can lower the redefault probability by 18 percent, compared to a modification that does not reduce payments.

Moreover, the findings show an even lower level of redefault when payment reduction is accompanied by principal reduction. A payment relief can be the result of a reduction in the interest rate, extension of the loan term, or forgiveness of principal. The results suggest that among the different types of modifications, the principal forgiveness modification has the lowest redefault rate. We believe that this is because it addresses both the short-term issue of mortgage payment affordability and the longer-term problem of negative equity. This finding is consistent with current efforts to include principal reduction when modifying loans. Of course, to compare the relative effectiveness of different loan modifications, the net present values of different loan modifications need to

be calculated, based on a dynamic model of loan performance. We plan to examine these issues over a longer period of time in a companion paper.

We also find that there are significant differences in redefault risks on the basis of the timing of the intervention (loan modification). Early intervention works best as it is associated to lower redefault risks. This supports efforts such as the FDIC's program that allows for modifying loans preventively, i.e., when borrowers appear likely to experience new difficulties meeting their mortgage obligations. Conversely, the findings suggest that waiting for borrowers to be 90 days delinquent before intervening may not be a good idea as the probability of redefault is much higher at that point in time.

As expected, we find that local economic conditions play a key role on the success of loan modifications: a one percent rise in local unemployment leads to a 1.4 percentage point increase in the probability of redefault. As the economy continues to deteriorate, it may be increasingly difficult to disentangle these macro-factors from loan-related issues. Even if modifications are successful in the short term, for instance, by lowering the loan rate to increase affordability, redefault may occur if borrowers later experience job loss due to a deteriorating local economy.

Finally, the results underline the importance of finding more innovative approaches to help borrowers who have negative equity in their homes. The results indicate that households with negative home equity are more likely to redefault over time, even when a modification has initially lowered mortgage payment. For these loans and loans that were poorly underwritten at origination, more significant loan restructuring or refinancing may be needed to minimize redefault risks. This finding is consistent with current bankruptcy reform efforts to pass legislation that would give bankruptcy judges new power to restructure mortgages and reduce mortgage payments.

Our findings illustrate that not all modifications are created equal. The industry clearly needs standards and directives for making more modifications and more sustainably than is the current practice. To the extent practicable, modifications need to be tailored to the particular conditions of the borrower, loan product, and market. We believe much data exists in the shared databases and within servicers' own portfolios to apply better modification decisions at a greater scale.

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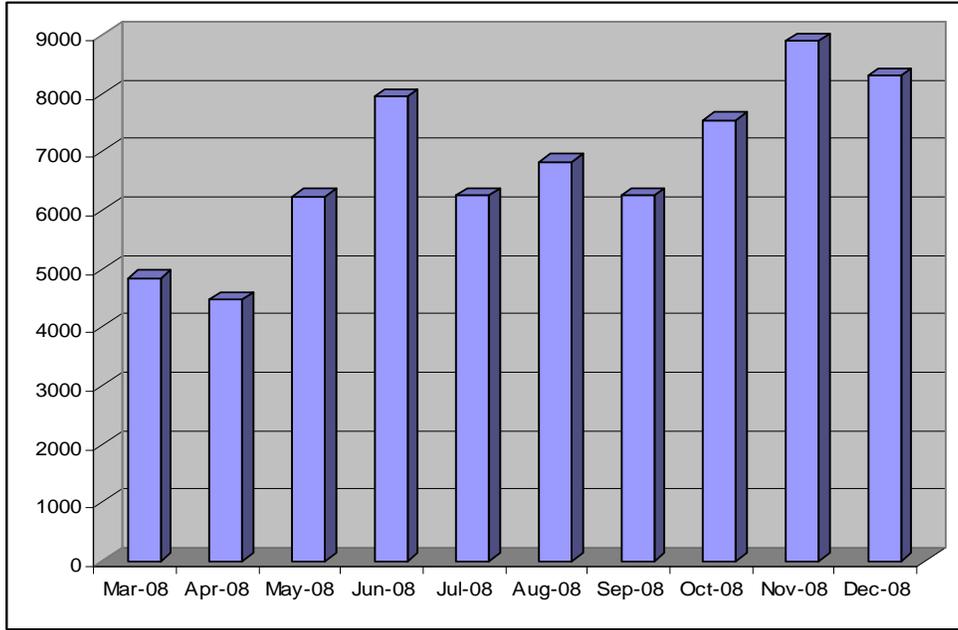
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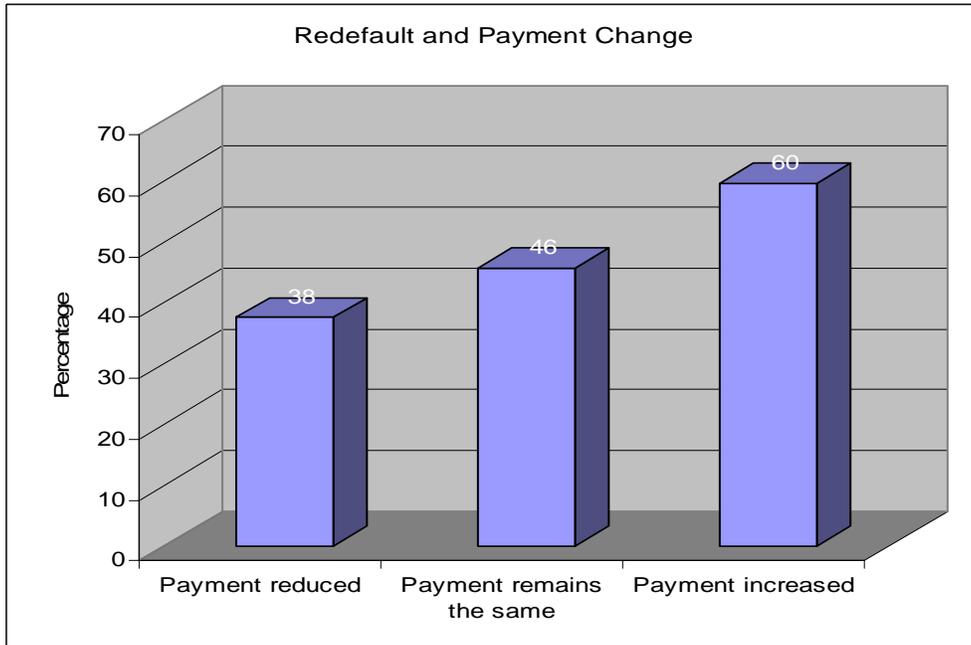
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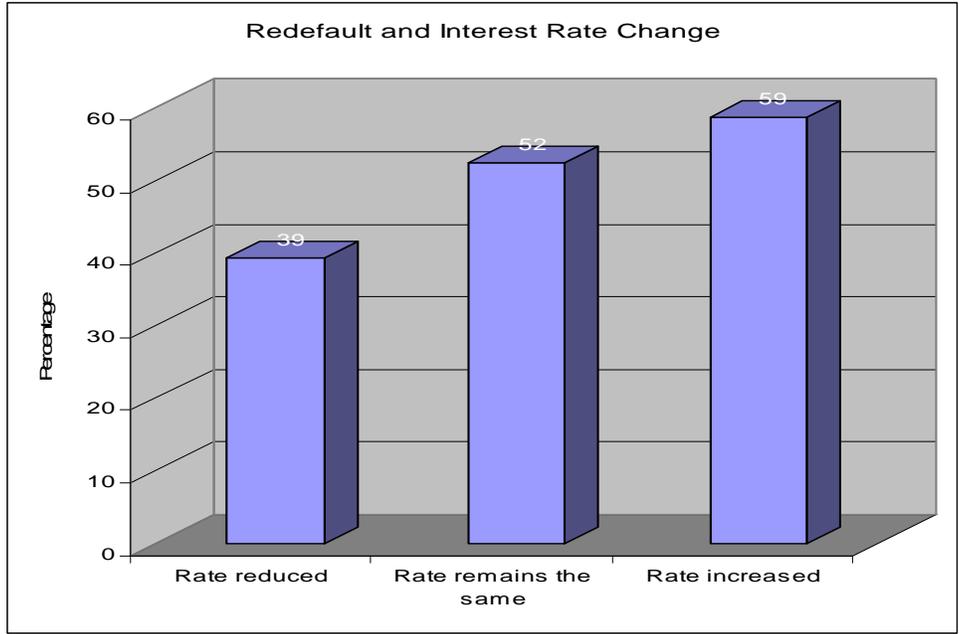
**Figure 1 Loan Modifications by Month**

Note: based on the 2006 deals of the remittance reports. These are raw numbers without any exclusion.



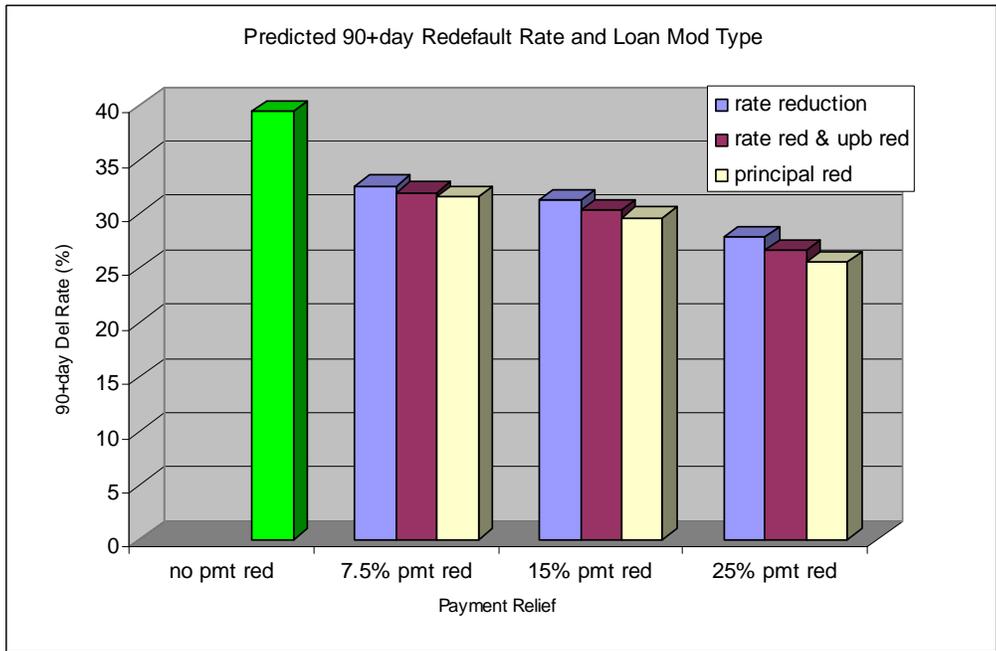
**Figure 2 Redefault (30+day) and Mortgage Payment Change**

Note: based on the 2006 deals of the remittance reports. Redefault is defined as 30+day delinquency as of December 2008. If the value after modification is in the range of 99-101 percent of the value before the modification, we consider it as “the same”.



**Figure 3 Redefault (30+day) and Interest Rate Change**

Note: based on the 2006 deals of the remittance reports. Redefault is defined as 30+day delinquency as of December 2008. If the value after modification is in the range of 99-101 percent of the value before the modification, we consider it as “Same”.



**Figure 4 Predicted Redefault (90+day) Rate and Type of Modifications**

Note: Estimation is based on the results of Model 1 in Table 6. Estimation is for an average borrower holding 30-year home purchase mortgage originated in January 2006, with an adjustable interest rate of 8.84 percent in the second quarter 2008. The original loan amount is \$238,726. The property is not in CA or FL and not served by the major four servicers. The loan has average value for other regressors.

Table 1 Characteristics of Different Loan Types

	Loan-type	FICO Score	OLTV	Interest rate	ARM (%)	PPP(%)	Interest Only(%)	Low/No doc (%)	At least 1 risky factor *	N Obs
All Loans	Missing	671	73.25	8.12	61.45	53.11	27.9	55.2	88.11	757,035
	Conventional	698	72.72	7.17	58.74	35.69	42.51	52.6	85.57	205,018
	FHA	564	93.46	6.84	4.44	0	0	95.1	99.48	4,075
	VA	578	88.82	6.96	1.51	0	0	99.8	100	465
	Conventional w/ PMI	715	90.62	6.82	13.78	3.9	6.37	55.3	81.12	1,822
	Jumbo	740	71.00	6.64	0	0	15.61	45.7	55.46	1,839
	Conforming	674	72.12	8.24	63.24	50.39	28.78	68.6	79.52	90,244
	Non Conforming	695	76.01	7.66	70.53	48.29	37.66	66.5	94.78	35,586
	Subprime	629	71.73	9.07	57.57	62.24	19.18	37.3	91.54	171,743
	Other	694	74.45	7.25	0	11.83	29.28	85.6	91.33	2,206
	Alt A	702	76.11	8.15	60.41	55.4	22.02	76.2	92.25	20,675
	Total									
Modified Sample	Missing	617	81.53	8.84	91.42	78.77	24.49	36.8	89.70	6273
	Conventional	604	82.33	9.04	76.92	58.65	19.71	43.7	96.47	624
	Conforming	614	81.91	8.85	93.89	70.90	17.36	46.7	96.09	409
	Non Conforming	635	81.31	8.40	97.45	79.62	28.03	63.7	94.90	157
	Subprime	604	82.59	8.80	90.18	76.26	26.35	34.8	93.92	2220
	Other	663	80.00	7.38	0.00	0.00	100.00	100	100.00	2
	Alt A	675	75.03	10.06	75.00	62.50	37.50	75	87.50	8
	Total									

\*Features that are considered risky include 1) borrower FICO score less than 620; 2) interest-only mortgage; 3) negative amortization mortgages; 4) limited or no documentation; 5) original loan-to-value ratios higher than 90 percent.

Table 2 Descriptive Statistics

Characteristics	Value
Original FICO	614
Interest rate	8.84
Appraisal Value	260194
Loan Amount	238726
OLTV	81.83
Home purchase	46.04%
ARM	90.37%
Interest Only	24.39%
Negative Amort	4.30%
Full-doc/Alt-doc	62.34%
<b>Origination Year</b>	
2005	33.57%
2006	66.43%
<b>Property Location</b>	
CA	24.95%
FL	11.72%
TX	4.56%
AZ	4.32%
MI	4.22%
MD	3.43%
Others	46.80%
<b>Servicer</b>	
Servicer 1	30.42%
Servicer 2	23.32%
Servicer 3	13.30%
Servicer 4	7.49%
Others	25.47%
<b>Redefault as of Dec 08 (30+day)</b>	44.75%
<b>N</b>	9,693

Table 3 Loan Modifications by Payment Reduction

Payment reduction	Frequency	Percent
>40% reduction	566	5.84
30-40% reduction	844	8.71
20-30% reduction	1272	13.12
10-20% reduction	1479	15.26
5-10% reduction	596	6.15
1-5% reduction	404	4.17
No reduction	2272	23.44
Increase	2260	23.32
Total	9,693	

Note: Based on the 2006 deals of the remittance reports. All second-liens, non-owner-occupied, and loans with missing information have been excluded.

Table 4 Types of Loan Modifications

Variable1	Loan Mod Type 1	Percent
r0p0	rate reduction and principal reduction	6.19
r0p1	rate reduction only	52.92
r1p0	principal reduction only (rare)	2.26
r1p1**	no rate reduction and no principal reduction (traditional)	38.63
Total		9,693

\*\* Reference group in the model.

Note: Based on the 2006 deals of the remittance reports. All second-liens, non-owner-occupied, and loans with missing information have been excluded.

Table 5 Logit Regression of Redefault (30+day)

Parameter	Model 1			Model 2		
	Estimate	P -Value	Marginal Effect	Estimate	P -Value	Marginal Effect
Intercept	-4.769	0.000		-5.111	0.000	
FICO Score	-0.003	0.000	-0.001	-0.003	0.000	-0.001
30- or 60-days Del when Modified	0.488	0.000	0.121	0.489	0.000	0.121
90+day Del when Modified	0.572	0.000	0.141	0.574	0.000	0.141
Times_in_del in prior 12 mons	0.118	0.000	0.029	0.127	0.000	0.031
Loan Balance (in log)	0.397	0.000	0.098	0.406	0.000	0.100
Estimated CLTV	0.314	0.054	0.077	0.421	0.011	0.104
ARM	0.184	0.020	0.045	0.203	0.010	0.049
Interest only	0.070	0.203	0.017	0.119	0.030	0.029
Full_doc	-0.106	0.032	-0.026	-0.096	0.052	-0.024
Home Purchase	0.343	0.000	0.084	0.334	0.000	0.082
Unemployment rate	0.058	0.000	0.014	0.052	0.000	0.013
y2006	0.123	0.015	0.030	0.156	0.002	0.038
CA	0.075	0.334	0.018	0.064	0.407	0.016
FL	0.330	0.000	0.082	0.318	0.000	0.079
Servicer1	0.131	0.043	0.032	0.155	0.021	0.038
Servicer2	0.202	0.002	0.050	0.231	0.000	0.057
Servicer3	0.030	0.711	0.007	-0.046	0.555	-0.011
Servicer4	-0.025	0.796	-0.006	0.087	0.359	0.022
pmt reduced >40%	-1.052	0.000	-0.229			
pmt reduced 30-40%	-0.802	0.000	-0.183			
pmt reduced 20-30%	-0.577	0.000	-0.136			
pmt reduced 10-20%	-0.470	0.000	-0.112			
pmt reduced 5-10%	-0.432	0.000	-0.103			
pmt reduced 1-5%	-0.215	0.064	-0.052			
pmt same (99%-101%)	0.043	0.557	0.011			
r0p0: rate and principal reduced				-0.840	0.000	-0.189
r0p1: rate reduced only				-0.543	0.000	-0.133
r1p0: principal reduced only				-0.420	0.007	-0.100
pseudo R-sq		0.1520			0.1477	
Log likelihood		-5866.1			-5890.4	

Note: N=9,693

Table 6 Logit Regression of Redefault (90+day)

Parameter	Model 1			Model 2		
	Estimate	P -Value	Marginal Effect	Estimate	P -Value	Marginal Effect
Intercept	-6.344	0.000		-6.428	0.000	
FICO Score	-0.001	0.026	0.000	-0.001	0.026	0.000
30- or 60-days Del when Modified	0.513	0.000	0.098	0.459	0.000	0.088
90+day Del when Modified	0.707	0.000	0.130	0.620	0.000	0.114
Times_in_del in prior 12 mons	0.089	0.000	0.016	0.094	0.000	0.017
Loan Balance (in log)	0.329	0.000	0.058	0.340	0.000	0.060
Estimated CLTV	0.490	0.006	0.086	0.585	0.001	0.104
ARM	0.247	0.005	0.041	0.294	0.001	0.049
Interest only	-0.011	0.862	-0.002	0.027	0.654	0.005
Full_doc	-0.168	0.002	-0.030	-0.160	0.003	-0.029
Home Purchase	0.410	0.000	0.073	0.407	0.000	0.073
Unemployment rate	0.052	0.000	0.009	0.047	0.001	0.008
y2006	0.142	0.013	0.025	0.176	0.002	0.031
CA	0.204	0.016	0.037	0.215	0.011	0.039
FL	0.380	0.000	0.072	0.375	0.000	0.071
Servicer1	-0.023	0.755	-0.004	-0.049	0.514	-0.009
Servicer2	0.161	0.024	0.029	0.226	0.001	0.041
Servicer3	-0.078	0.396	-0.014	-0.184	0.042	-0.031
Servicer4	-0.204	0.054	-0.034	-0.144	0.166	-0.025
pmt reduced >40%	-0.884	0.000	-0.123			
pmt reduced 30-40%	-0.651	0.000	-0.098			
pmt reduced 20-30%	-0.523	0.000	-0.082			
pmt reduced 10-20%	-0.362	0.000	-0.059			
pmt reduced 5-10%	-0.300	0.007	-0.049			
pmt reduced 1-5%	-0.151	0.222	-0.026			
pmt same (99%-101%)	0.347	0.000	0.064			
r0p0: rate and principal reduced				-0.776	0.000	-0.113
r0p1: rate reduced only				-0.517	0.000	-0.092
r1p0: principal reduced only				-0.179	0.291	-0.030
pseudo R-sq		0.103			0.0971	
Log likelihood		-4986.5			-5017.9	

Note: N=9,693

Table 7 Logit Regression of Redefault for Modifications with Significant Payment Reduction (with 5% or more payment reduction)

Parameter	30+day			90+day		
	Estimate	P -Value	Marginal Effect	Estimate	P -Value	Marginal Effect
Intercept	-4.669	0.000		-5.796	0.000	
FICO Score	-0.002	0.002	-0.001	-0.001	0.320	0.000
30- or 60-days Del when Modified	0.437	0.000	0.103	0.309	0.013	0.046
90+day Del when Modified	0.762	0.000	0.177	0.652	0.000	0.097
Times_in_del in prior 12 mons	0.105	0.000	0.024	0.097	0.000	0.014
Loan Balance (in log)	0.309	0.000	0.070	0.274	0.000	0.038
ARM	0.142	0.272	0.032	0.079	0.611	0.011
Interest only	0.073	0.362	0.017	0.083	0.387	0.012
Full_doc	-0.037	0.606	-0.008	-0.049	0.559	-0.007
Home Purchase	0.254	0.000	0.058	0.305	0.000	0.043
Unemployment rate	0.054	0.000	0.012	0.068	0.000	0.010
y2006	-0.027	0.696	-0.006	-0.088	0.281	-0.012
Servicer1	0.163	0.058	0.037	-0.087	0.393	-0.012
Servicer2	-0.181	0.127	-0.040	-0.210	0.125	-0.028
Servicer3	-0.106	0.298	-0.024	-0.326	0.010	-0.043
Servicer4	-0.030	0.862	-0.007	-0.059	0.773	-0.008
estimated cltv 70-80%	0.167	0.189	0.038	0.083	0.595	0.012
estimated cltv 80-90%	0.319	0.010	0.074	0.175	0.244	0.025
estimated cltv 90-95%	0.344	0.020	0.081	0.356	0.144	0.055
estimated cltv 95-100%	0.406	0.006	0.096	0.275	0.129	0.041
estimated cltv >100%	0.304	0.024	0.070	0.300	0.063	0.044
pseudo R-sq		0.1255			0.0708	
Log likelihood		-2815.4			-2138.6	

Note: N=4,757